МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ
ХАРКІВСЬКА НАЦІОНАЛЬНА АКАДЕМІЯ МІСЬКОГО ГОСПОДАРСТВА

МЕТОДИЧНІ ВКАЗІВКИ
ДЛЯ САМОСТІЙНОЇ РОБОТИ
З ДИСЦИПЛИНИ “ІНОЗЕМНА МОВА”
(АНГЛІЙСЬКА МОВА)

(для студентів 1 курсу денної форми навчання освітньо-кваліфікаційного рівня бакалавр напряму підготовки 6.060301 - “Гідротехніка (Водні ресурси)” спеціальності “Водопостачання та водовідведення”

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Методичні вказівки для самостійної роботи з дисципліни “Іноземна мова” (англійська мова) (для студентів 1 курсу денної форми навчання освітньо-кваліфікаційного рівня бакалавр напряму підготовки 6.060301 - “Гідротехніка (Водні ресурси)” спеціальності “Водопостачання та водовідведення”./ Харк. нац. акад. міськ. госп-ва; уклад.: Кладько Н. С., Костенко О. О. – Х.: ХНАМГ, 2011 – 76 с.

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Методичні вказівки для самостійної роботи призначенні для студентів денної форми навчання, які в майбутньому працюватимуть у сфері водопостачання та водовідведення. Головною метою їх є формування навичок читання і розуміння інформації з автентичних англомовних джерел та засвоєння необхідного обсягу лексичного матеріалу, що відповідає вимогам професійно-орієнтованого навчання іноземній мови. Зміст завдань відповідає вимогам навчальних програм, а тематика текстів сприяє розширенню обсягу сучасної англійської науково-технічної лексики. Запропонована інформація необхідна для ефективного виконання професійних обов’язків майбутніх спеціалістів.

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CONTENT:

INTRODUCTION

These educational materials are designed for the ESP students of the 1st year of studies of the speciality “Water Supply and Distribution” to develop their knowledge and skills in technical English according to their profession.

This manual is based on the authentic texts from different sources concerning water supply and distribution problems. It contains the tasks for reading and translation, speaking, writing, vocabulary tasks, texts and tasks for summarizing. The manual consists of 7 units and is expected to be covered during practical classes.

Each unit contains:

- pre-reading activity (questions and tasks)
- an authentic text for reading, translation and discussion in class;
- comprehension exercises;
- exercises for memorization and mastering key vocabulary;
- texts for summarizing.

UNIT 1
EDUCATIONAL SYSTEMS IN DIFFERENT COUNTRIES

English as a global language

Because English is so widely spoken, it has often been referred to as a "world language", and while it is not an official language in most countries, it is currently the language most often taught as a foreign language. Some linguists believe that it is no longer the exclusive cultural property of "native English speakers", but is rather a language that is absorbing aspects of cultures worldwide as it continues to grow. It is the official language for aerial and maritime communications. English is an official language of the United Nations and many other international organizations, including the International Olympic Committee.

English is the language most often studied as a foreign language in the European Union, by 89% of schoolchildren, ahead of French at 32%. Among some non-English speaking EU countries, a large percentage of the adult population can converse in English — in particular: 85% in Sweden, 83% in Denmark, 79% in the Netherlands, 66% in Luxembourg and over 50% in Finland, Slovenia, Austria, Belgium, and Germany.

Books, magazines, and newspapers written in English are available in many countries around the world, and English is the most commonly used language in the sciences because 95% of articles were written in English, even though only half of them came from authors in English-speaking countries.

This increasing use of the English language globally has had a large impact on many other languages, leading to language shift and even language death.

English speakers have many different accents, which often signal the speaker's native dialect or language. Within England, variation is now largely confined to pronunciation rather than grammar or vocabulary.

Just as English itself has borrowed words from many different languages over its history, English loanwords now appear in many languages around the world, indicative of the technological and cultural influence of its speakers.

Great Britain, USA, Canada, Australia and New Zealand are English speaking countries. They are situated in different parts of the world and differ in many ways.

The nature of these countries, their weather and climate and way of life of their people differ. Each country has its own history customs, traditions, and its own national holidays. But they all have a common language. English is the language of the people who left England to make their names in new countries.

Here are the main countries where English is the first official language.

The United Kingdom of Great Britain and Northern Ireland consist of 4 parts: England, Scotland, Wales, and Northern Ireland. The British Isles are group of islands lying off the north-west coast of the continent of Europe. There are no high mountains, no very long river, no great forest. The population of the U.K. is almost fifty-six million.

The USA is situated in the central part of the North American continent. The population is more than 236 million people. The USA is a highly developed industrial country. There are two main political parties, the Democratic Party and the Republican Party.

Canada has area of nearly 10 million square kilometers. Its western coast is washed by the Pacific Ocean and its eastern coast by the Atlantic Ocean. The population of Canada is over 26 million people. Canada is a capitalist federal state and a member of the Commonwealth.

The Commonwealth of Australia territories are the continent of Australia, the island of Tasmania and number of smaller islands. Australia has an area of nearly eight million square kilometers. The population of Australia is over sixteen million people. The Commonwealth of Australia is a capitalist self- governing federal state.

New Zealand is situated south-east of Australia. The country consists of the large islands called North Island, South Island and Stewart Island and also many small islands. The population of New Zealand is over three million people. New Zealand is a capitalist self-governing state and a member of the Commonwealth.

1. Answer the questions:

1. What are the reasons to refer English as a "world language"?

2. Which organizations use English as an official language?
3. List countries using English as their first and second language.
4. Has English an impact on many other languages? What does it lead them to?
5. What is the role of English in mass media industry?

2. Complete the following sentences, using the text:

1. English is the language most often studied as .....
2. Books, magazines, and newspapers written in .....
3. This increasing use of the English language .....
4. Great Britain, USA, Canada, Australia and New Zealand .....
5. The British Isles are group of .....
6. Canada has an area of .....
7. Australia has an area of .....
8. The population of New Zealand is .....
9. There are no high mountains, no very long river in .....
10. The nature, weather, climate and way of people`s life of Great Britain, USA, Canada, Australia and New Zealand .....

3. Match the words with their definitions:

1. nature	a. exchange of information, ideas or feelings
2. climate	b. the right to possess, use and dispose of anything
3. aerial	c. the long-term prevalent weather condition of an area
4. maritime	d. typical mode of behavior
5. communication	e. an effect of one thing or person on another
6. to develop	f. to come to more advanced or expanded stage
7. property	g. relating to navigating, shipping
8. influence	h. existing, moving or operating in the air
9. industry	i. the whole system of the existence of all physical life
10. customs	j. output of a specified product or service

Educational System in Great Britain

All British children must stay at school from the age of 5 until they are 16. Many of them stay longer and take final examination when they are 17 or 18. Before 1965 all children had to go through special intelligence tests. There were different types of state secondary schools and at the age of 11 children went to different schools in accordance of with the results of the tests.

State schools are divided into the following types: grammar schools (children who go to grammar schools are usually those who show a preference for academic subjects), technical schools (boys and girls who are interested in working with their hands and learning in a practical way can go to a technical schools and learn some trade, comprehensive schools (these schools usually combine all types of secondary education; they have physic, chemistry, biology laboratories, machine workshops for metal and woodwork and also geography, history and art departments, commercial and domestic courses).

There are also many schools which the State doesn't control. They are private schools. They charge fees for educating children and many of them are boarding schools, at which pupils live during the term time.

After leaving school many young people go to colleges or further education.

There are over 90 universities in GB. They are divided into three types: the old universities (Oxford, Cambridge and Edinburgh Universities), in the 19th century universities, such as London and Manchester universities, and the new universities. Some years ago there were also polytechnics. After graduating from polytechnic a student got a degree, but it was not a university degree. 31 formers polytechnics were given university status in 1992.

Full courses of study offer the degree of Bachelor of Art or Science. Most degree courses at universities last three years, language courses 4 years. Medicine and dentistry courses are longer (5-7 years).

Students may receive grants from the Local Education Authority to help pay for books, accommodation, transport, and food. This grant depends on the income of their parents.

Students don't usually have a job during term time because the lessons called lectures, seminars, classes of tutorials (small groups), are full time. However, many students now have to work in the evenings.

University life is considered «an experience». The exams are competitive but the social life and living away from home are also important. The social life is excellent with a lot of clubs, parties, concerts, bars.

There are not only universities in Britain but also colleges. Colleges offer courses in teacher training, courses in technology and some professions connected with medicine.

1. Answer the questions:

1. What kinds of schools are there in GB?
2. What do you know about comprehensive schools?
3. How many universities are there in GB? Which are the most famous?
4. What do you know about polytechnics? Do they still exist?
5. Do students have a job during term time? Why?

2. Put the following words into the sentences:

grants, the State, competitive, degree, boarding schools, accommodation, universities, colleges, fees

1. There are many schools which _____ doesn't control.
2. The exams are _____.
3. Oxford, Cambridge and Edinburgh are the old _____.
4. Private schools charge _____ for educating children and many of them are.
5. _____ are schools where pupils live during the term time.
6. Students may receive _____ from the Local Education Authority.
7. With the help of grants students pay for books, food and _____.
8. _____ offer courses in teacher training.
9. Full courses of study offer the _____ of Bachelor of Art or Science.

3. Ask as many questions to this text as possible. Use all types of questions.

Educational System in the USA

Translate the following words and expressions:

A traditional pattern, to precede, to provide, an attendance, an accommodate, to fail, to support, an admission, a certificate of graduation, a tuition, a registration, higher education, to divide, broad fields, liberal arts, undergraduate and graduate levels.

The general pattern of education in the USA is an eight-year elementary school, followed by a four-year high school. It is preceded, in many localities, by nursery schools and kindergartens. It is followed by a four-year college and professional schools. This traditional pattern, however, has been varied in many different ways.

American education provides a program for children, beginning at the age of 6 and continuing up to the age of 16 in some of the states, and to 18 in others.

The length of the school year varies among the states. Wide variation exists also in the length of the school day. A common practice is to have school in session from 9:00 to 12:00 in the morning and from 1:00 to 3:30 in the afternoon, Monday through Friday. Most schools require some homework to be done by elementary pupils.

There are eight years of elementary schooling. The elementary school is followed by four years of secondary school, or high school.

The school year is nine months in length, beginning early in September and sometimes a shorter one in spring. There are slight variations from place to place. Students enter the first grade at the age of six and attendance is compulsory in most states until the age of sixteen or until the student has finished the eighth grade.

The elementary schools tend to be small. The high schools are generally larger and accommodate pupils from four or five elementary schools. A small town generally has several elementary schools and one high school. In some rural communities the one-room country school house still exists.

Admission to the American high school is automatic on completion of the elementary school. During the four-year high school program the student studies four or five major subjects per year, five days a week. In addition, the student usually has classes in physical education, music, and art several times a week. If he fails a course, he repeats only that course and not the work of the entire year. Students must

complete a certain number of courses in order to receive a diploma, or a certificate of graduation.

Institutions of higher learning supported by public funds are not absolutely free. The state colleges and universities charge a fee for tuition or registration. This fee is higher for those who come from outside the state.

Private colleges and universities, especially the larger, well-known ones such as Harvard, Princeton, and Yale, have rigid scholastic requirements for entrance, including an examination.

It has become common for the college program to be divided into broad fields, such as languages and literature, the social sciences, the sciences and mathematics, and the fine arts. Certain Courses, such as English or history, may be required for all, with some election permitted in the other fields.

Professional education in fields such as agriculture, dentistry, law, engineering, medicine, pharmacy, and teaching is pursued in professional schools which may be part of a university or may be separate institutions which confine their instruction to a single profession. Three to five years of specialized training lead to professional degrees such as Doctor of Medicine, Bachelor of Law.

There are plenty of well-known educational establishments that have great experience in giving a nice level of qualification.

Harvard College was established in 1636, with the principal purpose of providing a literate ministry for colonial churches. It was a small institution, enrolling only 20 students in 1642 and 60 in 1660. It soon became more than a theological training school and established itself as a liberal arts college.

The next institution of higher learning established in the American colonies was the College of William and Mary, which opened in 1693 at Williamsburg, Virginia.

Other colleges were founded in the next century, but all of them remained small schools for long periods. Students entered at the age of 14 and remained until they were 18.

Private colleges and universities were established in various states. The first state university was the University of Virginia, founded in 1819. Some state universities

have large endowment funds which provide a substantial portion of their support. Other sources of income are student fees, gifts and endowments.

In general, higher education in the USA may be divided into two broad fields: liberal arts and professional. Each of these fields may be further subdivided into undergraduate and graduate levels.

1. Answer the questions:

1. Describe the school system in the USA.
2. When do children usually start their education and finish it?
3. What is the difference between the elementary and high school?
4. Are there any state universities or colleges?
5. What are the most well-known educational establishments in the USA?

2. Define the sentences as true or false:

1. The general pattern of education in the USA is a nursery school and a kindergarten, an eight-year elementary school, and a four-year high school, followed by a four-year college and professional schools.
2. This traditional pattern is the same in many localities.
3. Schooling is compulsory education in the United States.
4. The length of the school year and the length of the school day vary among the states.
5. Most schools require some homework to be done by elementary pupils.
6. If a student fails a course, he repeats the work of the entire year.
7. Institutions of higher learning are absolutely free.
8. Harvard College was the first educational establishment emerged in this country.
9. The first educational establishments of that days emerged in the 18^{th} century.
10. The main sources of income in the universities are large endowment funds, student fees, gifts and endowments.

3. Make up a summary of this text.

Ukraine's National Higher Education System

The first higher education institutions (HEIs) emerged in Ukraine during the late 16th and early 17th centuries. The first Ukrainian higher education institution was the Ostrozka School, or Ostrozkiy Greek-Slavic-Latin Collegium, similar to Western European higher education institutions of the time. Established in 1576 in the town of Ostrog, the Collegium was the first higher education institution in the Eastern Slavic territories.

The oldest university was the Kyiv Mohyla Academy, first established in 1632 and in 1694 officially recognized by the government of Imperial Russia as a higher education institution. Among the oldest is also the Lviv University, founded in 1661. More higher education institutions were set up in the 19th century, beginning with universities in Kharkiv (1805), Kiev (1834), Odessa (1865), and Chernivtsi (1875) and a number of professional higher education institutions.

Rapid growth followed in the Soviet period. By 1988 a number of higher education institutions increased to 146 with over 850,000 students. Most HEIs established after 1990 are those owned by private organizations.

In Ukraine, as in other developed countries, higher education is considered to be one of the main human values. Ukraine has inherited from the past a well-developed and multifunctional system of higher education. The dynamics is a characteristic trait of the current civilization, increasing social role of an individual, humanization and democratization of society, intellectualization of labour, fast change in technologies and equipment worldwide. All these require the creation of such which will allow Ukraine to become the ever-educated nation. The establishment of the national higher education system is based on the new legislative and methodological grounds.

The higher education consists of higher educational establishments, scientific and methodological facilities under federal and municipal governments and self-governing bodies in charge of education. The higher education structure includes also the post-graduate and Ph. D. Programs and self-education. The higher education includes two major educational levels, namely basic higher education and full higher education. The legislation sets the following educational and qualification levels –

junior specialist, bachelor, specialist, master, as well as scientific degrees of candidate of sciences (assistant professor) and doctor of sciences (Ph. D.). Educational and qualification level is trait of higher education by the level of gained qualities which will enable this individual to perform the appropriate occupational tasks or responsibilities at a certain qualification level. Senior scientific researcher, assistant professor and professor are the applied degrees.

The Ukraine's State Higher Education System includes 940 higher educational institutions (HEI), out of which 806 are public and 134 are of other forms of property ownership. Non-public HEIs are mandatory and legally acknowledged and controlled by the state through the educational activity's licensing mechanism and accreditation. HEIs in Ukraine are comprised of vocational schools, colleges, institutes, conservatories, academies, universities.

According to the HEIs status the following 4 levels of accreditation are set:

Level I – vocational schools and other HEIs equaled to them which teach junior specialists by using educational and professional programs (EPPs);

Level II – colleges, other HEIs equaled to them which teach bachelors, and if need be junior specialists, by using EPPs;

Level III – institutes, conservatories, academies, universities which teach bachelors and specialists by using EPPs;

Level IV – institutes, conservatories, academies, universities which teach bachelors, masters and specialists by using EPPs.

HEIs' graduates are given state standard diploma after they complete education under respective EPPs based on the results of state attestation. The following educational and qualification levels granted to the experts exist in Ukrainian system of higher education: junior specialist, bachelor, specialist and master.

A lot of non-governmental higher educational institutions appeared recently which leads to increasing of economic and business profile students. Since 1997 students can study at higher educational institutions on contract basis.

Ukraine's higher educational system fulfills important social functions creating intellectual potential of Ukraine as a new independent state entering the world community.

Higher education supplies all spheres of national economy with qualified professionals and looks for the better ways of development and perfection.

1. Answer the questions:

1. When and where did the first higher education institution emerge in Ukraine?
2. The oldest university was officially recognized by the government of Imperial Russia as a higher education institution, wasn`t it?
3. What are the most important trends increasing nowadays?
4. What is the establishment of the national higher education system based on?
5. What does the higher education structure in Ukraine include?

2. Fill in the gaps in the sentences:

1. The _____ was the Ostrozka School.
2. The oldest university was first established in _____.
3. In all developed countries higher education is considered to be _____.
4. Since 1997 students can study at higher educational institutions on _____.
5. Institutes, conservatories, academies, universities which teach bachelors and specialists belong to Level IV.
6. The following educational and qualification levels are: _____.
7. _____ consists of higher educational establishments, scientific and methodological facilities under federal and municipal governments and self-governing bodies in charge of education.
8. The _____ is a characteristic trait of the current civilization.
9. Social role of an individual, humanization and democratization of society, intellectualization of labor, fast change in technologies and equipment worldwide are _____ nowadays.
10. The higher education consists of _____.

3. Make up a summary of this text.

UNIT 2
WATER AND ITS CHARACTERITICS

Water

1. Find the following words using your dictionary:

liquid, aquifer, precipitations, odour, condensed, moderate, potability, glacier, vapour, iceberg, hue, soluble

2. Read the following text and write questions to the answers:

Water is a common chemical substance that is essential to all known forms of life. In typical usage, water refers to its liquid form or state, but the substance also has a solid state, ice, and a gaseous state, water vapor. About 1,460 teratonnes (Tr) of water covers 71% of the Earth's surface, mostly in oceans and other large water bodies, with 1.6% of water below ground in aquifers and very little part in the air as vapor, clouds and precipitations. Some of the Earth's water is contained within man-made and naturals objects near the Earth's surface such as water towels, animals and plant bodies, manufactured products, food.

Water is chemical substance: one molecule of water has two hydrogen atoms covalently bonded to a single oxygen atom. Water is tasteless, odorless liquid and colorless in small quantities, although it has its own intrinsic very light blue hue. Ice also colorless and water vapor is essentially invisible as a gas. Water has the second highest specific heat capacity of any known chemical compound, after ammonia, as well as a high heat of vaporization, both of which are a result of the extensive hydrogen bonding between its molecules. These two unusual properties allow water to moderate Earth's climate by buffering large fluctuations in temperature.

Water takes many different forms on Earth: water vapor and clouds in the sky; seawater and rarely icebergs in the oceans; glaciers and rivers in the mountains; and aquifers in the ground. Water can dissolve many different substances, giving it different tastes and odours. In fact, humans and other animals have developed senses to be able to evaluate the potability of water: animals generally dislike the taste of salty water and putrid swamps and favor the purer water of a mountain spring. The

taste in spring water or mineral water derives from the minerals dissolved in it, as pure H_2O is tasteless. As such, purity in spring and mineral water refers to purity from toxins, pollutants, and microbes.

Water covers 71% of the Earth's surface; the oceans contains 97% of the Earth's water. The Antarctic ice sheet, which contains 90% of all fresh water on Earth, is visible at the bottom. Condensed atmospheric water can be seen as clouds.

Saltwater oceans hold 97% of surface water, glaciers and polar ice caps 2.5% and other land surface water such as rivers and lakes 0.6% Water moves continually through a cycle of evaporation or transpiration and runoff, usually reaching the sea. Winds carry water vapor over land at the same rate as runoff into the sea, about 36Tr per year. Evaporation and transpiration contribute 71 Tr per year to the precipitation of 107 Tr per year over land. Some water is trapped for varying periods in ice caps, glaciers, aquifers, or in lakes sometimes providing fresh water for life on land. Clean, fresh water is essential to human and other life. In many parts of the world, it is in short supply. Many organic molecules as well as salts, sugars, acids, alkalis, and some gases(especially oxygen), are soluble in water.

1. The substance also has a solid state, ice, and a gaseous state, water vapor.
2. Water covers 71% of the Earth's surface.
3. One molecule of water has two hydrogen atoms.
4. Animals generally dislike the taste of salty water and favor the purer water of a mountain spring.
5. The Antarctic ice sheet contains 90% of all fresh water on Earth.

3. Match words with their synonyms:

1. odour	a. insipid
2. tasteless	b. vast
3. intrinsic	c. smell
4. extensive	d. hidden
5. fluctuation	e. melt
6. invisible	f. unsteadiness

7. to moderate g. abate
8. dissolve h. inherit
9. contain i. hold
10. transpiration j. evaporation

4. Match words with their definitions:

precipitation	1) is unpleasant because it has no particular taste;
tasteless	2) a colour or type of colour
hue	3) land that is always very wet or covered with a layer of water
glacier	4) a substance that makes air, water, soil dangerously dirty, and is caused by cars, factories
spring	5) rain, snow that falls on the ground, or the amount of rain, snow that falls;
potable	6) the process of passing water through the surface of a plant's leaves;
swamp	7) a large mass of ice which moves slowly down a mountain valley;
pollutant	8) a place where water comes up naturally from the ground;
transpiration	9) potable water is safe to drink;

5. Fill in the gaps using the words below and translate the sentences into Russian:

liquid, precipitation, odour, glaciers, water vapour (2), hues, tasteless, evaporate, swamp

1. With its loss of flow, the river's old mouth had silted up, thus forming the lagoon and _____.
2. In the fall, Boston ivy vines take on red _____.
3. It was an ugly room with _____ decorations and shabby furniture.
4. She screamed as the boiling _____ burned her skin.
5. It smelt not only of mud and rotting materials, but also the unmistakable _____ of human waste.
6. _____ is a naturally occurring greenhouse gas but the amount of _____ in the atmosphere is affected by human activities.

7. Some particles, however, do not _____ completely and survive the entry-heat to impact on the Earth's surface.
8. In the last four days, we've had three inches of _____.
9. The streams gradually filled with gravel and left behind these ridges when the _____ melted.

The Wonder of Water

Match the following words with their Russian equivalents:

1. to overestimate	a. смягчать
2. fertile lands	b. многочисленные качества
3. the earth's surface	c. плодородные земли
4. water purification	d. многогранное вещество
5. transparent	e. увеличиваться в объёме
6. enormous quantities	f. прозрачный
7. expand	g. сжатие
8. squeeze	h. переоценивать
9. to	i. поверхность Земли
10. versatile substance	j. очистка воды

It is difficult to overestimate the importance of water in our life. All living matter, including rocks, food, and minerals, contain water. There is water underground and in the atmosphere. Areas of the world that have an adequate supply of water provided for fertile lands that can support many people in contrast to arid desert areas where people cannot live.

Without water there would be no life on the Earth at all. It plays an important role in our lives, maybe the most important after air. We all know that the human body consists of 80-85% of water, so we cannot live long without it. All living beings need water to live.

Nearly three-fourth of the earth's surface is one big ocean in which the continents are the large islands. Most of the earth's life exists in the ocean, and the ocean contains enormous quantities of nearly every element, including uranium,

silver, and gold. Despite its importance, until recent years, as little was known about the ocean as about other planets. Today we know, for example, that the land surface of the ocean has extremely high mountains and deep valleys. The island of Hawaii is the top of a mountain that is 33000 feet high-higher that any mountain in the Himalayas. And there are underwater canyons that are vastly larger than the Grand Canyon in the United States.

Scientists think that the life first appeared in the water and then had come out to the land. No one knows this for sure but we all agree that water is necessary for everybody.

Water is a colorless, odorless, tasteless liquid that is transparent. The green or blue colour of the sea is found only in deep water. Any taste in the water is usually due to the presence of minerals dissolved in the water. Water is the most versatile substance. It is frequently called the universal solvent because many substances are dissolved in water: sugar, gases, salt, and many minerals. Scientists believe the salt in the ocean water comes from the erosion of rocks.

The climate on the Earth is unique among all the planets in our solar system in that it allows water to exist in all three states: solid, liquid and gas. Water is one of the few materials which expands when it freezes. For example, if you freeze a closed bottle filled with water, the bottle will shatter. This expanding facility breaks stones and makes dirt out of rocks. Since ice takes up more space than water, it is less dense and floats on the tops of the oceans. If it did not, our oceans would be frozen solid. In ancient times people used to use that facility of water to break stones to make some kind of bricks to build their houses.

The other great ability of water is that it doesn't squeeze…Another unique characteristic of water is that it heats and cools more slowly than most other materials, especially other liquids. It takes more heat to boil water or melt ice than most substances require. These properties of water exert a powerful moderating effect on our climate. Water tends to moderate the temperature all year round. Areas near the ocean are generally warmer in winter and cooler in summer than inland areas. Water is remarkable in another way. If we could follow a drop of water we might find

that it travels around the world. As the sun warms the ocean, some of the water evaporates info the condenses and forms clouds. Some of the water falls as snow or water runs downhill through streams and rivers. Eventually most of the water returns to the oceans via the ground, waterfalls, streams, rivers. This perpetual circulation of water from the oceans to the air to the land and back to the oceans is called the water cycle.

In despite of the importance of water humankind continues to pollute it. We all know that there's a lot of water on the Earth, but we also know that there's not much of drinkable water, so we should take care of it. Nowadays people have found many ways to make fresh water out of salty, but still these processes are very difficult and expensive.

There are many different kinds of water purification processes. Mostly in our country we use the cheapest one, but not the best. In some other small, developed and rich countries like Kuwait, they use more sophisticated ways like putting a silver surface inside the pipes to kill bacteria and biological infections which can be very dangerous. As we all understand we cannot use such technologies just because of their material cost.

There'll be lots of problems if we take down the importance of water. For example, we can learn from the history, in the Middle Ages millions of people died from so called "Bubonic plague". And what was the reason for it? The reason was polluted water which spread the disease very fast. So water can play a very important role in our life, but it can also be dangerous if it's polluter. From the ancient times people used to build their cities and villages near river or lakes so they can have enough supply on water, but then those cities die if they don't take care of their water.

We may think that there's lots of water on the Earth, and there are lots people who purify it, but we need to think wider and think about the whole planet, let's do our part in water purification! Let's keep the rivers clean so we can drink clean water like in ancient times when it wasn't polluted!

1. Answer the questions:

1. Why water is so important for us and our planet?
2. What are the main properties and abilities of water?
3. What is a water cycle? Describe the process.
4. Why polluted water is dangerous for living beings?
5. What is the way to purify it?

2. Find out if the following statements are true or false.

1. All living beings contain water.
2. Water is the most versatile substance.
3. Water is never dangerous.
4. The reason for “Bubonic plague” was starvation.
5. Water exists in three states.
6. There are many different kinds of water purification processes.
7. We have a great store of drinkable water.
8. The erosion of rocks is the reason for the salt to appear in the ocean water.
9. Water tends to moderate the temperature all year round.
10. Scientists think that the life first appeared in the land and then had come to the water.

UNIT 3
WATER QUALITY AND PUBLIC HEALTH

Water cycle

Match the following words with their Russian equivalents:

1. water cycle	A. испаряться из почвы
2. on the surface of the globe	B. поднимающиеся воздушные потоки
3. to evaporate from the soil	C. пополнить водоносный пласт
4. rising air currents	D. химический состав
5. precipitation	E. на поверхности глобуса
6. to replenish aquifers	F. строительство плотин
7. urbanization	G. градостроительство
8. transpiration	H. просачивание
9. construction of dams	I. выпадение осадков
10. chemical composition	J. круговорот воды

The water cycle describes the continuous movement of water below, above and on the surface of the globe. Since the water cycle is truly a "cycle," there is no beginning or end. Water can change states among liquid, vapor, and ice at various places in the water cycle.

The sun, which drives the water cycle, heats water in the oceans. Water evaporates as vapor into the air. Rising air currents take the vapor up into the atmosphere where cooler temperatures cause it to condense into clouds. Air currents move clouds around the globe; cloud particles collide, grow, and fall out of the sky as precipitation. Some precipitation falls as snow and can accumulate as ice caps and glaciers, which can store frozen water for thousands of years. Snow packs can melt, and the melted water flows over land as snowmelt. A portion of runoff enters rivers in valleys. Runoff and groundwater are stored as freshwater in lakes. Not all runoff flows into rivers. Much of it soaks into the ground as infiltration. Some water infiltrates deep into the ground and replenishes aquifers, which store huge amounts of freshwater for long periods of time. Some infiltration stays close to the land surface

and can seep back into surface-water bodies (and the ocean) as groundwater discharge. Some groundwater finds openings in the land surface and comes out as freshwater springs. Over time, the water returns to the ocean, where our water cycle started.

Groundwater can spend over 10,000 years beneath Earth's surface before leaving. Particularly old groundwater is called fossil water. After evaporating, the residence time in the atmosphere is about 9 days before condensing and falling to the Earth as precipitation.

The water cycle describes the processes that drive the movement of water throughout the hydrosphere. However, much more water is "in storage" for long periods of time than is actually moving through the cycle. The storehouses for the vast majority of all water on Earth are the oceans. It is estimated that about 95% of the world's water supply is stored in oceans.

During colder climatic periods more ice caps and glaciers form, and enough of the global water supply accumulates as ice. During the last ice age glaciers covered almost one-third of Earth's land mass, with the result being that the oceans were about 122 m lower than today. During the last global "warm spell," about 125,000 years ago, the seas were about 5.5 m higher than they are now. About three million years ago the oceans could have been up to 50 m higher.

The scientific consensus expressed the water cycle to continue to intensify throughout the 21st century, though this does not mean that precipitation will increase in all regions. In subtropical land areas — places that are already relatively dry — precipitation is projected to decrease during the 21st century, increasing the probability of drought. The drying is projected to be strongest near the subtropics (for example, the Mediterranean Basin, South Africa, southern Australia, and the Southwestern United States).

Glacial retreat is also an example of a changing water cycle, where the supply of water to glaciers from precipitation cannot keep up with the loss of water from melting. Glacial retreat since 1850 has been extensive.

Human activities that alter the water cycle include:

- agriculture
- industry
- alteration of the chemical composition of the atmosphere
- construction of dams
- deforestation
- urbanization

The water cycle is powered from solar energy. 86% of the global evaporation occurs from the oceans. Without the cooling effect of evaporation the greenhouse effect would lead to a much higher surface temperature of 67 °C, and a warmer planet.

1. Answer the questions:

1. What is water cycle?
2. What is the role of the sun in that process?
3. How much time ice caps and glaciers can store frozen water?
4. What are the forecasts of the scientists relatively the water cycle to continue?
5. What are human activities that alter the water cycle?

2. Define the sentences as true or false:

1. The water cycle describes the continuous movement of water just on the surface of the globe.
2. Water can change states among liquid and ice at various places in the water cycle.
3. Groundwater can spend over 10,000 years beneath Earth's surface.
4. Over time, the water returns to the ocean, where our water cycle finished.
5. The water cycle describes the processes that drive the movement of water throughout the biosphere.
6. Deforestation is one of the human activities that alter the water cycle.
7. The water cycle is powered from nuclear power energy.
8. Some part of the global evaporation occurs from the oceans.
9. The Mediterranean Basin, South Africa, southern Australia, and the Southwestern United States are near the subtropics.

10. What is the reason for our planet to get warmer?

Water Quality

Water quality is the physical, chemical and biological characteristics of water. The most common standards used to assess water quality relate to drinking water, safety of human contact and for the health of ecosystems.

In the setting of standards, agencies make political and technical/scientific decisions about how the water will be used. In the case of natural water bodies, they also make some reasonable estimate of pristine conditions. Different uses raise different concerns and therefore different standards are considered. Natural water bodies will vary in response to environmental conditions. Environmental scientists work to understand how these systems function which in turn helps to identify the sources and fates of contaminants. Environmental lawyers and policy makers work to define legislation that ensures that water is maintained at an appropriate quality for its identified use.

The vast majority of surface water on the planet is neither potable nor toxic. In fact, water quality is a very complex subject, in part because water is a complex medium intrinsically tied to the ecology of the Earth. Industrial pollution is a major cause of water pollution, as well as runoff from agricultural areas, urban storm water runoff and discharge of treated and untreated sewage (especially in developing countries).

The parameters for water quality are determined by the intended use. Work in the area of water quality tends to be focused on water that is treated for human consumption or in the environment.

Contaminants that may be in untreated water include microorganisms such as viruses and bacteria; inorganic contaminants such as salts and metals; pesticides and herbicides; organic chemical contaminants from industrial processes and petroleum use; and radioactive contaminants.

Water quality depends on the local geology and ecosystem, as well as human uses such as sewage dispersion, industrial pollution, use of water bodies as a heat sink, and overuse.

Some people use water purification technology to remove contaminants from the municipal water supply they get in their homes, or from local pumps or bodies of water. For people who get water from a local stream, lake, or aquifer (well), their drinking water is not filtered by the local government.

1. Give the Russian equivalents to the words and phrases:

to make technical/scientific decisions, reasonable estimate, environmental conditions, to define legislation, an appropriate quality, discharge of treated and untreated sewage, pesticides and herbicides, the local geology and ecosystem, water purification technology.

2. Answer the questions:

1. What is water quality? Which characteristics are used to test it?
2. Are there different standards of safety for different uses of water? Why?
3. What is the main cause of water pollution?
4. Which contaminants can be found in untreated water?
5. What does water quality depend on?
6. Is *water quality* a simple subject? Why?

3. Which statements are True (T) or false (F) according to the article?

1. Water quality depends on numerous factors.
2. The parameters for water quality are determined by the intended use.
3. Water is a complex medium separated from all Earth systems.
4. Industrial pollution is the major cause of water pollution.
5. Environmental scientists work hard to identify the sources and fates of contaminants.

Environmental Water Quality

Match the following words with their Russian equivalents:

1. toxic substances	A. первоначальный, прежний
2. landscape	B. достижение целей
3. achieving goals	C. жидкий кислород
4. alkalinity	D. землетрясения
5. dissolved oxygen	E. вымирающие виды
6. earthquakes	F. пейзаж
7. endangered species	G. токсичные вещества
8. designation	H. щёлочность
9. pristine	I. полив
10. irrigation	J. обозначение, определение

Environmental water quality, also called *ambient* water quality, relates to water bodies such as lakes, rivers, and oceans. Water quality standards vary significantly due to different environmental conditions, ecosystems, and intended human uses. Toxic substances and high populations of certain microorganisms can present a health hazard for non-drinking purposes such as irrigation, swimming, fishing, rafting, boating, and industrial uses. These conditions may also affect wildlife which uses the water for drinking or as a habitat. Modern water quality laws general specify protection of fisheries and recreational use and require as a minimum, retention of current quality standards.

There is some desire among the public to return water bodies to pristine or pre-industrial conditions. Most current environmental laws focus of the designation of uses. In some countries these allow for some water contamination as long as the particular type of contamination is not harmful to the designated uses. Given the landscape changes in the watersheds of many freshwater bodies, returning to pristine conditions would be a significant challenge. In these cases, environmental scientists focus on achieving goals for maintaining healthy eco-systems and may concentrate of the protection of populations of endangered species and protecting human health.

The complexity of water quality as a subject is reflected in the many types of measurements of water quality indicators. Some of the simple measurements listed below can be made on-site — temperature, pH, dissolved oxygen, conductivity, in direct contact with the water source in question. More complex measurements that must be made in a lab setting require a water sample to be collected, preserved, and analyzed at another location. Making these complex measurements can be expensive. Because direct measurements of water quality can be expensive, ongoing monitoring programs are typically conducted by government agencies. However, there are local volunteer programs and resources available for some general assessment.

Inevitably after events such as earthquakes and Tsunamis, there is an immediate response by the aid agencies as relief operations get underway to try and restore basic infrastructure and provide the basic fundamental items that are necessary for survival and subsequent recovery. Access to clean drinking water and adequate sanitation is a priority at times like this. The threat of disease increases hugely due to the large numbers of people living close together, often in squalid conditions, and without proper sanitation.

After a natural disaster, as far as water quality testing is concerned there are widespread views on the best course of action to take and a variety of methods can be employed. There are a number of potable water test kits on the market widely used by aid and relief agencies for carrying out such testing.

The following is a list of indicators often measured by situational category for drinking water: alkalinity, color of water, pH, taste and odor, dissolved metals and salts (sodium, chloride, potassium, calcium, manganese, magnesium), microorganisms, dissolved metals and metalloids (lead, mercury, arsenic), dissolved organics, radon, heavy metals, pharmaceuticals and hormone analogs.

1. Answer the questions:

1. What is *ambient* water quality?
2. What do you know about the modern water quality laws?
3. What do the environmentalists do to protect water bodies?
4. What kinds of measurement do you know?

5. Which indicators are used to measure the quality of drinking water?

2. Complete the sentences, using the text:

1. Water quality standards vary _____
2. Toxic substances and high populations of certain microorganisms can present _____
3. Some of the simple measurements listed below can be made on-site _____
4. There are a number of potable water test kits _____
5. The following is a list of indicators often measured by situational category for drinking water: _____

3. Fill in the gaps:

1. Environmental water quality, also called _____, relates to water bodies such as lakes, rivers, and oceans.
2. These conditions may also affect _____ which uses the water for drinking or as a habitat.
3. There is some desire among the _____ to return water bodies to pristine or pre-industrial conditions.
4. Environmental scientists focus on _____ for maintaining _____.

Drought

A drought is an extended period of months or years when a region notes a deficiency in its water supply. It can have a substantial impact on the ecosystem and agriculture of the affected region. Although droughts can persist for several years, even a short, intense drought can cause significant damage and harm the local economy. This global phenomenon has a widespread impact on agriculture. The United Nations estimates that an area of fertile soil the size of Ukraine is lost every year because of drought, deforestation, and climate instability.

Drought is a normal, recurring feature of the climate in most parts of the world. It is among the earliest documented climatic events.

Periods of drought can have significant environmental, agricultural, health, economic and social consequences. The effect varies according to vulnerability. For example, subsistent farmers are more likely to migrate during drought because they do not have alternative food sources. Areas with populations that depend on subsistence farming as a major food source are more vulnerable to drought-triggered famine. Drought is rarely if ever the sole cause of famine; socio-political factors such as extreme widespread poverty play a major role. Drought can also reduce water quality, because lower water flows reduce dilution of pollutants and increase contamination of remaining water sources.

A few common consequences of drought include:

- Famine due to lack of water for irrigation;
- Habitat damage, affecting both terrestrial and aquatic wildlife.
- Dehydration and related diseases;
- Mass migration;
- Shortages of water for industrial users;
- Snakes migration and increases in snakebites;
- Social unrest;
- War over natural resources, including water and food;

As a drought persists, the conditions surrounding it gradually worsen and its impact on the local population gradually increases. People tend to define droughts in three main ways:

1. Meteorological drought is brought about when there is a prolonged period with less than average precipitation. Meteorological drought usually precedes the other kinds of drought.

2. Agricultural droughts are droughts that affect crop production or the ecology of the range. This condition can also arise independently from any change in precipitation levels when soil conditions and erosion triggered by poorly planned agricultural endeavors cause a shortfall in water available to the crops.

3. Hydrological is brought about when the water reserves available in sources such as aquifers, lakes and reservoirs fall below the statistical average. Hydrological

drought tends to show up more slowly because it involves stored water that is used but not replenished. Like an agricultural drought, this can be triggered by more than just a loss of rainfall.

1. Answer the questions:

1. What is drought?
2. Does this global phenomenon have a widespread impact on ecosystems and agriculture?
3. What are the common consequences of a drought?
4. What are the main ways to define a drought?
5. What is a hydrological drought?

2. Complete the sentences:

1. Droughts have a widespread_____.
2. An area of fertile soil the size of Ukraine is lost every year because of _____.
3. Periods of drought can have significant _____.
4. Drought can also reduce _____.
5. A few common consequences of drought include _____.
6. People tend to define droughts _____.
7. Meteorological drought is _____.
8. Agricultural droughts are _____.
9. Hydrological drought is brought _____.
10. As a drought persists, the conditions surrounding it gradually _____.

3. Ask as many questions to the text as possible. Use all types of questions.

Flood

A flood is an overflow or accumulation of an expanse of water that submerges land. Flooding may result from the volume of water within a body of water, such as a river or lake, which overflows or breaks levees, with the result that some of the water escapes its normal boundaries. While the size of a lake or other body of water will

vary with seasonal changes in precipitation and snow melt, it is not a significant flood unless such escapes of water endanger land areas used by man like a village, city or other inhabited area.

Floods can also occur in rivers, when the strength of the river is so high it flows out of the river channel and causes damage to homes and businesses along such rivers.

Rivering floods are classified into two groups, slow and fast.

Slow kind is runoff from sustained rainfall or rapid snow melt exceeding the capacity of a river's channel. Causes include heavy rains from monsoons, hurricanes and tropical depressions, foreign winds and warm rain affecting snow pack.

Fast kinds include flash floods resulting from convective precipitation (intense thunderstorms) or sudden release from an upstream impoundment created behind a dam, landslide, or glacier.

Coastal floods caused by severe sea storms, or as a result of another hazard (tsunami or hurricane). Catastrophic floods, caused by a significant and unexpected event (dam breakage), or as a result of another hazard (earthquake or volcanic eruption).

Physical damage can range anywhere from bridges, cars, buildings, sewer systems, roadways, canals and any other type of structure.

People and livestock die due to drowning. It can also lead to epidemics and waterborne diseases. Clean drinking water becomes scarce. Spread of water-borne diseases happens due to unhygienic conditions. Shortage of food crops can be caused due to loss of entire harvest. Non-tolerant species of flora and fauna can die from suffocation. Economic hardship is evident due to temporary decline in tourism, rebuilding costs, food shortage leading to price increase.

Remembering the misery and destruction caused by the 1910 Great Flood of Paris, the French government built a series of reservoirs which helps remove pressure from the Seine during floods, especially the regular winter flooding. London is protected from flooding by a huge mechanical barrier across the River Thames, which is raised when the water level reaches a certain point.

Venice has a similar arrangement, although it is already unable to cope with very high tides.

Currently the Saint Petersburg Flood Prevention Facility Complex was finished in 2008, in Russia, to protect Saint Petersburg from storm surges. It also has a main traffic function, as it completes a ring road around Saint Petersburg. Eleven dams extend for 25.4 kilometres and stand eight metres above water level.

In Egypt, both the Aswan Dam (1902) and the Aswan High Dam (1976) have controlled various amounts of flooding along the Nile river.

Clean-up activities following floods often pose hazards to workers and volunteers involved in the effort. Potential dangers include: electrical hazards, heat or cold stress, fire, drowning, and exposure to hazardous materials. In planning for and reacting to flood disasters, managers provide workers with hard hats, goggles, heavy work gloves, life jackets, and watertight boots with steel toes and insoles. There are many disruptive effects of flooding on human settlements and economic activities. However, floods (in particular the more frequent/smaller floods) can bring many benefits, such as recharging ground water, making soil more fertile and providing nutrients in which it is deficient. Flood waters provide much needed water resources in particular in arid and semi-arid regions where precipitation events can be very unevenly distributed throughout the year. Freshwater floods in particular play an important role in maintaining ecosystems in river corridors and are a key factor in maintaining floodplain biodiversity.

1. Answer the questions:

1. What is a flood? What does it result from?
2. What is the classification of a flood?
3. What is the difference between the slow kind of a flood and the fast one?
4. What is the reason for coastal flood to occur?
5. Are the effects of the flood dramatic?
6. What happens with crops and food supplies?
7. How people protect their places?
8. Is there any danger for workers and volunteers in clean-up activity?

9. What uniform have workers and volunteers wear to protect themselves from electrical hazards, heat or cold stress, fire, drowning, and exposure to hazardous materials?
10. Are there any benefits of flood? What are they?

2. Fill in the gaps:

1. Flooding may result from the volume of water within a body of water, such as a river or lake, which _____ with the result that some of the water escapes its normal boundaries.
2. Floods can also occur in rivers, when the strength of the river is so high it flows out of the river channel and causes damage to _____ along such rivers.
3. _____ floods are classified into two groups: _____.
4. Causes of the _____include heavy rains from monsoons, hurricanes and tropical depressions, foreign winds and warm rain affecting snow pack.
5. Fast kinds include flash floods resulting from _____ or _____ created behind a dam, landslide, or glacier.
6. _____ caused by a significant and unexpected event, or as a result of another hazard.
7. _____ can range anywhere from bridges, cars, buildings, sewer systems, roadways, canals and any other type of structure.
8. Spread of water-borne diseases happens due to_____.
9. Non-tolerant species of flora and fauna can die_____.
10. Floods can bring many benefits, such as _____.

3. Make up a summary of this text.

Desalination

1. Read the text and answer the questions.

Desalination is an artificial process by which saline water (generally sea water) is converted to fresh water. The most common desalination processes are distillation and reverse osmosis. Desalination is currently expensive compared to most

alternative sources of water, and only a very small fraction of total human use is satisfied by desalination. It is only economically practical for high-valued uses (such as household and industrial uses) in arid areas. The most extensive use is in the Persian Gulf.

1) Is desalination an artificial or natural process?
2) Is desalination expensive or cheap sources of water?
3) Is this process used in your country?

2. Use the Internet to find out about Desalination in different countries and prepare a short report to tell the class about it.

UNIT 4
WATER SUPPLY

Freshwater

Water is a critical issue for the survival of all living organisms. Many can use salty water but many organisms including the great majority of higher plants and most mammals must have access to freshwater to grow bigger. Some terrestrial mammals, especially desert rodents appear to survive without drinking but they do generate water through the metabolism of cereal seeds and they also have mechanisms to conserve water to the maximum degree.

Only three percent of the water on Earth is freshwater, and about two-thirds of this is frozen in glaciers and most of the rest is underground and only 0.3 percent is surface water. Freshwater lakes, most notably Lake Baikal in Russia and the Great Lakes in North America, contain seven-eighths of this fresh surface water. Swamps have most of the balance with only a small amount in rivers, most notably the Amazon River. The atmosphere contains 0.04% water.

Freshwater is an important natural resource necessary for the survival of all ecosystems. The use of water by humans for activities such as irrigation and industrial applications can have adverse impacts on down-stream ecosystems. Chemical contamination of freshwater can also seriously damage eco-systems.

Pollution from human activity, including oil spills, also presents a problem for freshwater resources. The largest oil spill that has ever occurred in freshwater was caused by a Shell tank ship in Magdalena, Argentina, on January 15, 1999, polluting the environment, drinkable water, plants and animals.

The source of almost all freshwater is precipitation from the atmosphere, in the form of mist, rain and snow. A very small proportion is emitted from active volcanoes. Freshwater falling as mist, rain or snow contains materials dissolved from the atmosphere and material from the sea and land over which the rain bearing clouds have travelled.

In industrialized areas rain is typically acid because of dissolved oxides of sulphur and nitrogen formed from burning of fossil fuels in cars, factories, trains and aircraft and from the atmospheric emissions of industry. In extreme cases this causes acid rain which has caused severe pollution of lakes and rivers in parts of Scandinavia, Scotland, Wales and the United States.

In desert areas rain bearing winds can pick up sand and dust and this can be deposited elsewhere in precipitation and causing the freshwater flow to be measurably contaminated both by insoluble solids but also by the soluble components of those soils. This effect can cause unwelcome contamination with dust from the Chernobyl disaster being spread across Europe in rain clouds.

Changing landscape for the use of agriculture has a great effect on the flow of freshwater. Changes in landscape by the removal of trees and soils changes the flow of freshwater in the local environment and also affects the cycle of freshwater. As a result more freshwater is stored in the soil which benefits agriculture. However, since agriculture is the human activity that consumes the most freshwater, this can put a severe strain on local freshwater resources resulting in the destruction of local ecosystems.

Freshwater is a renewable and changeable, but limited natural resource. Freshwater can only be renewed through the process of the water cycle, where water from seas, lakes, rivers, and dams evaporates, forms clouds, and returns to water sources as precipitation. However, if more freshwater is consumed through human activities than is restored by nature, the result is that the quantity of freshwater available in lakes, rivers, dams and underground waters is reduced which can cause serious damage to the surrounding environment.

1. Answer the questions:

1. Is water a critical issue for the survival of all living organisms?
2. What percent of the water on the Earth is fresh water?
3. Which human activities can have adverse impacts on down-stream ecosystems?
4. Is fresh water nonrenewable or renewable natural resource?
5. What is the main source of almost all freshwater?

2. Complete the sentences, using the text:

1. Water is a critical issue for_____.
2. About two-thirds of fresh water is _____.
3. Freshwater is an important natural resource necessary for _____.
4. Chemical contamination of freshwater can_____.
5. The source of almost all freshwater is_____.
6. In industrialized areas rain is typically acid because_____.
7. Acid rain can has cause severe pollution of lakes and rivers in parts of _____.
8. Freshwater is a renewable and changeable, but _____.
9. Changing landscape for the use of agriculture has a great effect on _____.
10. Freshwater can only be renewed through _____.

3. Ask as many questions to this text as possible. Use all types of questions.

Sources of Fresh Water

Match the following words with their Russian equivalents:

1. irrigation methods	A. подача свежей воды
2. power plant	B. районы, расположенные на высоте
3. evaporation	C. обессоливание, опреснение
4. intermittent	D. ёмкость для хранения
5. supply of fresh water	E. прерывистый, прерывающийся
6. storage capacity	F. электростанция
7. desalination	G. употребление в большом количестве
8. high-valued uses	H. методы орошения
9. household uses	I. для домашнего употребления
10. high altitude areas	J. испарение

Surface water is water in a river, lake or fresh water wetland. Surface water is naturally replenished by precipitation and naturally lost through discharge to the oceans, evaporation, and sub-surface seepage.

The total quantity of water available at any given time is an important consideration. Some human water users have an intermittent need for water. For example, many farms require large quantities of water in the spring, and no water at all in the winter. To supply such a farm with water, a surface water system may require a large storage capacity to collect water throughout the year and release it in a short period of time. Other users have a continuous need for water, such as a power plant that requires water for cooling. To supply such a power plant with water, a surface water system only needs enough storage capacity to fill in when average stream flow is below the power plant's need.

Desalination is an artificial process by which saline water (generally sea water) is converted to fresh water. The most common desalination processes are distillation and reverse osmosis. Desalination is currently expensive compared to most alternative sources of water, and only a very small fraction of total human use is satisfied by desalination. It is only economically practical for high-valued uses (such as household and industrial uses) in arid areas. The most extensive use is in the Persian Gulf.

Brazil is the country estimated to have the largest supply of fresh water in the world, followed by Russia and Canada.

Several schemes have been proposed to make use of icebergs as a water source.

The Himalayas, which are often called "The Roof of the World", contain some of the most extensive and rough high altitude areas on Earth as well as the greatest area of glaciers. Ten of Asia’s largest rivers flow from here and more than a billion people’s livelihoods depend on them.

As global population grows, and as demand for food increases in a world with a fixed water supply, there are efforts underway to learn how to produce more food with less water, through improvements in irrigation methods and technologies, agricultural water management, crop types, and water monitoring.

1. Find out if the following statements are true or false.

1. There are efforts underway to learn how to produce less food with more water.

2. Desalination is currently expensive compared to most alternative sources of water.
3. Ten of Asia's largest rivers flow from The Himalayas and more than a billion people's livelihoods depend on them.
4. Desalination is a natural process by which fresh water is converted to salt water.

2. Answer the questions:

1. What do you think are the main sources of fresh water in your own country?
2. What countries have the largest supply of fresh water in the world?
3. What is desalination? What do you know about this process?
4. Why it is so important to improve irrigation methods and technologies?

3. Complete the sentences, using the text:

1. As global population grows _____
2. Many farms require _____
3. The most extensive use of desalination is _____
4. _____ are distillation and reverse osmosis.
5. The Himalayas contain some _____
6. To supply a power plant with water_____

Sources of Drinking Water

1) The water emerging from some deep groundwater may have fallen as rain many decades or even hundreds of years ago. Soil and rock layers naturally filter the groundwater to a high degree of clarity before it is pumped to the treatment plant. Such water may emerge as springs, artesian springs, or may be extracted from boreholes or wells. Deep groundwater is generally of very high bacteriological quality. There may be a requirement to reduce the iron or manganese content of this water to make it pleasant for drinking, cooking, and laundry use. Disinfection is also required.

2) Water emerging from shallow groundwater is usually abstracted from wells or boreholes. The bacteriological quality can be variable depending on the nature of the

catchment. A variety of soluble materials may be present including potentially toxic metals such as zinc and copper. Arsenic contamination of groundwater is a serious problem in some areas, notably from shallow wells in Bangladesh and West Bengal in the Ganges Delta.

3) Typically located in the headwaters of river systems, upland reservoirs are usually sited above any human habitation and may be surrounded by a protective zone to restrict the opportunities for contamination. Bacteria and pathogen levels are usually low, but some bacteria, protozoa or algae will be present. Many upland sources have low pH which requires adjustment.

Low land surface waters will have a significant bacterial load and may also contain algae, suspended solids and a variety of dissolved constituents.

4) Atmospheric water generation is a new technology that can provide high quality drinking water by extracting water from the air by cooling the air and thus condensing water vapour. Rainwater harvesting or fog collections which collect water from the atmosphere can be used especially in areas with significant dry seasons.

1. Answer the questions:

1. What main sources of drinking water are mentioned in the text?
2. What quality has deep groundwater?
3. Where can we get shallow ground water from?
4. What quality has water from upland lakes and reservoirs?
5. What is the technology of obtaining atmospheric water?

2. Match the headings with the paragraphs:

1. Upland lakes and reservoirs.
2. Deep groundwater.
3. Rivers, canals and low land reservoirs.
4. Shallow groundwater.

3. Match the endings of the sentences with their beginnings:

1. Low land surface waters a. of very high bacteriological quality.

2. The bacteriological quality can be variable — b. are usually low.
3. Deep groundwater is generally — c. may contain algae and suspended solids.
4. Bacteria and pathogen levels — d. depending on the nature of the catchment

Surface water

Lake Chungara and Parinacota volcano in northern Chile.

1. Find the following words using the vocabulary:

*wetland capacity	
*total quantity	
*replenished	
*discharge	
*seepage	
*storage	
*artificial reservoir	
*augment	
*watershed	
*negligible	
*permeability	

2. Read the following text, translate and answer the questions.

Surface water is water in a river, lake or fresh water wetland. Surface water is naturally replenished by precipitation and naturally lost through discharge to the

oceans, evaporation, and sub-surface seepage. Although the only natural input to any surface water system is precipitation within its watershed, the total quantity of water in that system at any given time is also dependent on many other factors. These factors include storage capacity in lakes, wetlands and artificial reservoirs, the permeability of the soil beneath these storage bodies, the runoff characteristics of the land in the watershed, the timing of the precipitation and local evaporation rates. All of these factors also affect the proportions of water lost.

Human activities can have a large impact on these factors. Humans often increase storage capacity by constructing reservoirs and decrease it by draining wetlands. Humans often increase runoff quantities and velocities by paving areas and channelizing stream flow.

The total quantity of water available at any given time is an important consideration. Some human water users have an intermittent need for water. For example, many farms require large quantities of water in the spring, and no water at all in the winter. To supply such a farm with water, a surface water system may require a large storage capacity to collect water throughout the year and release it in a short period of time. Other users have a continuous need for water, such as a power plant that requires water for cooling. To supply such a power plant with water, a surface water system only needs enough storage capacity to fill in when average stream flow is below the power plant's need.

Nevertheless, over the long term the average rate of precipitation within a watershed is the upper bound for average consumption of natural surface water from that watershed.

Natural surface water can be augmented by importing surface water from another watershed through a canal or pipeline. It can also be artificially augmented from any of the other sources listed here; however in practice the quantities are negligible. Humans can also cause surface water to be "lost" (i.e. become unusable) through pollution.

Brazil is the country estimated to have the largest supply of fresh water in the world, followed by Russia and Canada.

1. What is surface water?
2. Is precipitation the only natural input to any surface water system?
3. Is the total quantity of water dependent on many factors?
4. What are these factors?
5. How human activities can impact on these factors?
6. Why some human water users have an intermittent need for water?
7. Which water users have a continuous need for water?
8. Is there any country estimated to have the largest supply of fresh water?

3. Read the statements below and decide if they are True(T) or False(F):

1. Surface water is naturally replenished by rains, melting snow and ice.
2. There are lots of natural inputs to any surface water system.
3. Surface water is naturally lost through discharge to the oceans, evaporation.
4. These factors include storage capacity in lakes, wetlands and artificial reservoirs.
5. All of these factors don't affect the proportions of water lost.
6. Humans seldom increase runoff quantities and velocities by paving areas and channelizing stream flow.
7. Many farms require large quantities of water in the spring and in winter.
8. To supply such a power plant with water, a surface water system only needs enough storage capacity to fill in.
9. Farm animals can also cause surface water to be "lost" through pollution.
10. Russia is the country to have the largest supply of fresh water followed by Brazil and Canada.

4. In this part each problem consists of an uncompleted sentence. You should find the one choice which best completes the sentence.

1. Surface water is naturally replenished _____ precipitation and naturally lost through discharge to the oceans.

   A) with

   B) without

   C) by

D) of

2. The only natural _____ to any surface water system is precipitation within its watershed.

   A) way

   B) range

   C) quantity

   D) input

3. All of these factors also affect the _____ of water lost.

   A) size

   B) proportions

   C) amount

   D) number

4. People often increase storage capacity by constructing _____ and decrease it by draining wetlands.

   A) reservoirs

   B) water systems

   C) power plant

   D) companies

5. Other users have a continuous need _____, such as a power plant that requires water for cooling.

   A) for cooling

   B) of natural oil

   C) for water

   D) for food

6. Nevertheless, over _____ the average rate of precipitation within a watershed is the upper bound for average consumption of natural surface water from that watershed.

   A) throughout the year

   B) long hours

   C) other factors

D) the long term

7. Natural surface water can be augmented by importing surface water from another watershed through a canal or _____.

   A) water ways

   B) pipeline

   C) waysides

   D) channel

8. It can also be artificially augmented from any of the other _____ listed here; however in practice the quantities are negligible.

   A) sources

   B) pipelines

   C) storage capacity

   D) short period of time

9. Humans can also _____ surface water to be "lost" (i.e. become unusable) through pollution.

   A) pollute

   B) use

   C) provide

   D) cause

5. Read the text again and write down the correct endings of the following sentences.

1) The text (article) is entitled .....

2) It is about .....

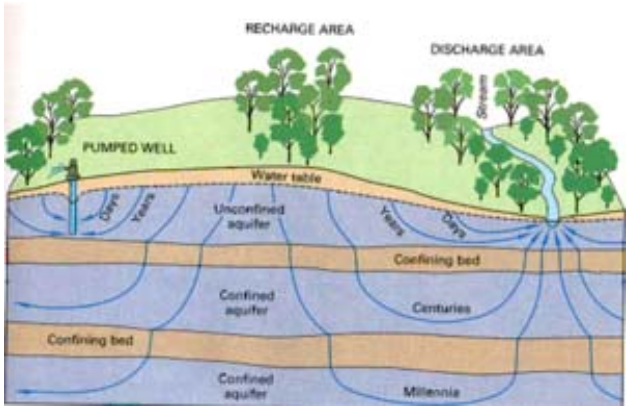
3) The author starts by telling the reader .....

4) He informs of .....

5) In conclusion .....

6. Tell the text in your own words.

Below water



Sub-Surface water travel time.

1. Find the following words using the vocabulary and match with their definition:

1. pore space	1. a gradual flow of liquid or gas through small spaces or holes
2. surface water	2. a person
3. storage	3. a place where water comes up naturally from the ground
4. seepage	4. containing or consisting of salt
5. occur	5. the act of buying and using products
6. human (human being)	6. the top layer of an area of water or land
7. spring	7. when you keep or put something in a special place while it is not being used
8. consumption	8. one of the small holes in your skin that liquid, especially sweat, can pass through, or a similar hole in the surface of a plant
9. saline	9. to happen or exist in a particular place or situation

2. Read the text.

Sub-surface water, or groundwater, is fresh water located in the pore space of soil and rocks. It is also water that is flowing within aquifers below the water table.

Sometimes it is useful to make a distinction between sub-surface water that is closely associated with surface water and deep sub-surface water in an aquifer (sometimes called "fossil water").

Sub-surface water can be thought of in the same terms as surface water: inputs, outputs and storage. The critical difference is that due to its slow rate of turnover, sub-surface water storage is generally much larger compared to inputs than it is for surface water. This difference makes it easy for humans to use sub-surface water unsustainably for a long time without severe consequences. Nevertheless, over the long term the average rate of seepage above a sub-surface water source is the upper bound for average consumption of water from that source.

The natural input to sub-surface water is seepage from surface water. The natural outputs from sub-surface water are springs and seepage to the oceans.

If the surface water source is also subject to substantial evaporation, a sub-surface water source may become saline. This situation can occur naturally under endorphin bodies of water, or artificially under irrigated farmland. In coastal areas, human use of a sub-surface water source may cause the direction of seepage to ocean to reverse which can also cause soil salinization. Humans can also cause sub-surface water to be "lost" (i.e. become unusable) through pollution. Humans can increase the input to a sub-surface water source by building reservoirs or detention ponds.

Water in the ground is in sections called aquifers. Rain rolls down and comes into these. Normally an aquifer is near the equilibrium in its water content. The water content of an aquifer normally depends on the grain sizes. This means that the rate of extraction may be limited by poor permeability.

3. Find out if the following statements are true or false.

1. Sub-surface water, or groundwater, is fresh water located in the rivers and oceans.
2. Sub-surface water can be thought of in the same terms as surface water.
3. Sub-surface water storage is generally much smaller compared to inputs than it is for surface water.
4. People can also cause sub-surface water to be "lost" through pollution.

5. It is impossible to increase the input to a sub-surface water source by building reservoirs.

4. What is your opinion about sub-surface water described in this article? Make up some sentences using the following phrases:

1) It is known as a fact that .....
2) There can be no doubt that .....
3) It should be noted that .....
4) In my opinion .....
5) To my mind .....

Technical Overview of Water supply

An adequate supply of pure, wholesome and palatable water is essential to the maintenance of high standards of health and to provide the convenience modern society demands. In some localities water is available in unlimited quantities and converting it to use is not a difficult problem. This is especially true of towns situated on large inland lakes or rivers. On the other hand there are cities where geographical location requires elaborate systems of water supply, and to provide a satisfactory supply of water in these localities becomes a large engineering task.

The importance of a sufficient supply of water for domestic and industrial purpose has long been a deciding factor in the location of cities. The earliest settlers realized this need and took advantage of natural water sources by establishing colonies in close proximity to them.

Water may be taken from any sources of water for human consumption after it has undergone a preliminary treatment to assure its purity. As man's communities grew in population, the demand for water increased and the need for protection of the source of water supply against the possibility of contamination became evident. Progress and civilization have called for elaborate and various systems and methods of water treatment.

Water supply systems get water from a variety of locations, including groundwater (aquifers), surface water (lakes and rivers), and the sea through the

desalination. The water is then, in most cases, purified, disinfected through chlorination. Treated water then either flows by gravity or is pumped to reservoirs, which can be elevated such as water towers or on the ground. Once water is used, wastewater is typically discharged in a sewer system and treated in a wastewater treatment plant before being discharged into a river, lake or the sea or reused for landscaping, irrigation or industrial use.

Many of the 3.5 billion people having access to pipe water receive a poor or very poor quality of service, especially in developing countries where about 80% of the world population lives. Water supply service quality has many dimensions: continuity; water quality; pressure; and the degree of responsiveness of service providers to customer complaints.

Drinking water quality has a micro-biological and a physico-chemical dimension. There are thousands of parameters of water quality. In public water supply systems water should, at a minimum, be disinfected – usually through chlorination – or it may need to undergo treatment, especially in the case of surface water.

Water pressures vary in different locations of a distribution system. Water mains below the street may operate at higher pressures, with a pressure reducer located at each point where the water enters a building or a house. In poorly managed systems, water pressure can be so low as to result only in a trickle of water or so high that it leads to damage to plumbing fixtures and waste of water. Pressure in an urban water system is typically maintained either by a pressurized water tank serving an urban area, by pumping the water up into a tower and relying on gravity to maintain a constant pressure in the system or solely by pumps at the water treatment plant and repeater pumping stations.

Continuity of water supply is taken for granted in most developed countries, but is a severe problem in many developing countries, where sometimes water is only provided for a few hours every day or a few days a week. It is estimated that about half of the population of developing countries receives water on an intermittent basis.

1. Give the Russian equivalents to the words and phrases:

wholesome and palatable water, the convenience modern society demands, elaborate systems of water supply, human consumption, disinfected through chlorination, a wastewater treatment plant, micro-biological dimension, plumbing fixtures.

2. Answer the questions:

1. Why the quality and quantity of supplied water is different in different places?
2. How the earliest settlers took decision to establish the colony at some place? What was the first reason for them to settle?
3. What are the dimensions for supply service quality?
4. Why water pressures vary in different locations?
5. Do you have an intermittent basis of providing water into your place?

3. Match the words with the definitions:

Locations	people in general considered in relation to the structure of laws and organizations
developing country	the place where something is
Population	the supply of treated and purified water for a community
urban area	a drain or a pipe that is underground used to carry away surface water
Treatment	water that is acceptable or satisfactory
Waste	the number of people who live in particular country or area
a sewer	a non-industrialized poor country that is seeking to develop its resources by industrialization
palatable water	a particular way of dealing with smth
Society	a city area
water supply	unwanted materials or substances that are left after a particular process

UNIT 5
WATER TREATMENT

Bottled water

Give the Russian equivalents to the words and phrases:

bottled water, tap water, scientific study, the Natural Resources Defense Council, high quality, contamination, organic chemicals, to recycle, toxic chemicals, food chain, marine life, re-usable water bottle

The fact is that bottled water sold in our country is not always filtered and not necessarily cleaner or safer than most tap water, according to a four-year scientific study recently made public by the Natural Resources Defense Council (NRDC). The NRDC's study included testing of more than 1,000 bottles of 103 brands of bottled water. While most of the tested waters were found to be of high quality, some brands were significantly contaminated.

About one-third of the waters tested contained levels of contamination including synthetic organic chemicals, bacteria, and arsenic. In fact, about a quarter of all bottled water is actually bottled tap water, according to government and industry estimates.

Most water companies use polyethylene plastics to bottle their products. The manufacturing process of these bottles requires a combination of natural gas and petroleum. It takes more than 17 million barrels of oil annually to create enough plastic to meet the demand for bottled water. That is enough to fuel more than one million cars for 1 full year.

Another problem is the transportation costs of bottled water. Water is very heavy and it takes a lot of fuel to transport millions of tons of drinking water every day. When the time comes to recycle these plastic bottles, even more oil is needed as recycling plants require large amounts of fuel and clean water to operate. So even the recycling of plastic bottles becomes a major depletion of the Earth's precious natural resources.

It is estimated that only about 15-20% of plastic bottles get recycled. The majority ends up in landfills, with a good portion making it out to the oceans where they will break down into smaller pieces. These plastic pellets absorb many toxic chemicals and are often mistaken for food by all types of marine life. This adversely affects the entire eco-system of the ocean as sickness and death is passed up and down the food chain. Since people eat seafood, our health is also affected by the plastics that pollute the seas.

The truth is we can all make a difference in the world simply by making a small change in our lifestyle and reducing our dependence on bottled water. Filtering your own pure water at home and using a re-usable water bottle is a small step that can make a big difference for the environment.

1. Answer the questions:

1. Which brands for bottled water do you know? Which one do you prefer?
2. Are you sure that the quality of the bottled water you usually buy is perfect?
3. What environmental problems we have due to recycling of plastic bottles?
4. Can we solve this problem or not?

2. Find out if the following statements are true or false:

1. Bottled water sold in our country is for sure filtered and safer than tap-water.
2. Changing our lifestyle and reducing our dependence on bottled water we can save our world.
3. A great percentage of plastic bottles get recycled.
4. Recycling of plastic bottles won`t solve the problem causing by the usage of bottled water.
5. Our health is also affected by the plastics.

Water Filter

A good water filter is the best and maybe the only solution nowadays. You can install and maintain the filters yourself and can ensure and feel safe about the water which you and your family drink. Just make sure the filter you choose removes the most spectrum of contaminants. Usually a professional filtration system worth invest-in is a 4 to 5 stage water purifier system. Each stage will remove certain types of contaminants, and all stages combined should protect you from just about every contaminant. Reverse osmosis water filters with activated carbon pre-filters, plus an ultraviolet light, are what we believe to be the most thorough and cost effective way to purify drinking water. Such a system will pay for itself within half a year and can last 10-15 years with easy annual filter changes.

Explain how a water filter works and why it is considered to be the best solution for today.

The History of Modern Water Filtration

The history of water filters is indelibly tied to the history of water, itself. As human industry has grown and water has become more contaminated, water filters have emerged over the centuries in response to the growing recognition of the need for pure, clean water to drink and the realization that such water does not occur naturally. Water has greatly affected humanity and civilization for millennia. Because water is so absolutely vital to our body systems, we, as living beings, are entirely dependent upon water. In fact, this simple substance, more than any other factor, guided the formation of civilization.

Early civilizations were clustered around water sources, and it was water that initiated the first substantial agriculture in the Fertile Crescent, leading to more complex and sedentary civilizations. For centuries, water availability guided the type of foodstuff that could be grown in an area. Water was also the impetus and guiding force behind the first cross-cultural interactions. Early trade was completely dependent upon water, for transportation of goods and sustenance of people and animals. Throughout the centuries, as technology developed, people have gradually gained more control of water. They have been able to transport water to arid lands, stop and redirect rivers, and even determine when, where, and how much rain will fall.

Even with increased control of water resources, water still continues to dominate the political, economic, and social structure of all nations. This statement can be verified by looking at political struggles within the United States over water resources or throughout the Middle East over access to limited water. Concerning conflict in the Middle East, former World Bank Vice President Ismail Serageldin stated in 2000, "Many of the wars of this century were about oil, but the wars of the next century will be about water". In modern times, concerns over water quality remain supreme. Over the years, scientists have discovered more and more contaminants in fresh water sources, and these same scientists have noted a strong correlation between drinking water contamination and many significant health problems.

Due to the rampant impurity of water and the crucial, physiological need for clean, fresh drinking water, several treatment alternatives have emerged throughout the history of water treatment. Water filtration, one of the more viable and prominent of these treatment alternatives, has something of a remarkable past. Historians believe that the use of water filters began more than 4000 years ago! The earliest recorded attempts to find or generate pure water date back to 2000 b.c.e. Early Sanskrit writings outlined methods for purifying water. These methods ranged from boiling or placing hot metal instruments in water before drinking it to filtering that water through crude sand or charcoal filters (Baker & Taras, 1981). These writings suggest

that the major motive in purifying water was to provide better tasting drinking water. It was assumed that good tasting water was also clean. People did not yet connect impure water with disease nor did they have the technology necessary to recognize tasteless yet harmful organisms and sentiments in water.

Centuries later, Hippocrates, the famed father of medicine, began to conduct his own experiments in water purification. He created the theory of the "four humors," or essential fluids, of the body that related directly to the four temperatures of the seasons. According to Hippocrates, in order to maintain good health, these four humors should be kept in balance. As a part of his theory of the four humors, Hippocrates recognized the healing power of water. For feverish patients, he often recommended a bath in cool water. Such a bath would realign the temperature and harmony of the four humors. Hippocrates acknowledged that the water available in Greek aqueducts was far from pure in its quality. Like the ancients before him, Hippocrates also believed good taste in water meant cleanliness and purity of that water. Hippocrates designed his own crude water filter to "purify" the water he used for his patients. Later known as the "Hippocratic sleeve," this filter was a cloth bag through which water could be poured after being boiled (Baker & Taras, 1981). The cloth would trap any sentiments in the water that were causing bad taste or smell. The ancient civilizations of Greece and Rome designed amazing aqueducts to route water pathways and provide the first municipal water systems.

On the American continent, archeological evidence suggests that the ancient Mayan civilization used similar aqueduct technology to provide water to urban residents. Further advancements in water technology ended, for the most part, with the fall of these civilizations. During the middle Ages, few experiments were attempted in water purification or filtration. Devout Catholicism throughout Europe marked this time period, often known as the Dark Ages due to the lack of scientific innovations and experiments. Because of the low level of scientific experimentation, the future for water purification and filtration seemed very dark.

The first record of experimentation in water filtration, after the blight of the Dark Ages, came from Sir Francis Bacon in 1627 (Baker & Taras, 1981). Hearing rumors

that the salty water of the ocean could be purified and cleansed for drinking water purposes, he began experimenting in the desalination of seawater. Using a sand filter method, Bacon believed that if he dug a hole near the shore through which seawater would pass, sand particles (presumable heavier than salt particles) would obstruct the passage of salt in the upward passage of the water; the other side of the hole would then provide pure, salt-free water. Sadly, his hypothesis did not prove true, and Bacon was left with salty, undrinkable water. His experiment did mark rejuvenation in water filter experimentation. Later scientists would follow his lead and continue to experiment with water filtration technology.

1. Answer the questions:

1. Did water effect the human civilization? In what way?
2. Do you think we are entirely dependent upon water? Why?
3. Did Hippocrates make a great contribution into the process of water purification? What do you know about him?
4. When did people start to use the water filters?

2. Fill in the gaps in the sentences:

1. Water guided the formation of _____.
2. Early civilizations were clustered around _____, and it was water that led to more complex civilizations.
3. Early _____ was completely dependent upon water, for transportation of _____ and sustenance of _____ and _____.
4. Water still continues to dominate the _____, _____, and _____ structure of all nations.
5. It is noted a strong correlation between _____ _____ contamination and many significant_____ _____.
6. The major motive in purifying water was to _____ better tasting drinking water.

3. Make up a summary of the text.

UNIT 6

USAGE OF WATER

Usage of fresh water

1. Find the following words using the vocabulary:

1. sewage	
2. consumptive	
3. irrigation	
4. run-off	
5. demand for	
6. estimate	
7. refinery	
8. enhance	
9. artificial	
10. whitewater boating	

2. Match the opposites:

1) renewable	a) minimize
2) produce	b) profitable
3) expensive	c) increase
4) enlarge	d) cooling (system)
5)unavailable	e) worst
6) reduce	f) consume
7) unprofitable	g) natural
8) improvement	h) non-renewable
9) artificial	i) available
10) heating	j) cheap

Usage of fresh water can be categorized as consumptive and non-consumptive (sometimes called "renewable"). A use of water is consumptive if that water is not immediately available for another use. Losses to sub-surface seepage and evaporation

are considered consumptive, as is water incorporated into a product (such as farm produce). Water that can be treated and returned as surface water, such as sewage, is generally considered non-consumptive if that water can be put to additional use.

Agricultural

A farm in Ontario

It is estimated that 69% of world-wide water use is for irrigation, with 15-35% of irrigation withdrawals being unsustainable. In some areas of the world irrigation is necessary to grow any crop at all, in other areas it permits more profitable crops to be grown or enhances crop yield. Various irrigation methods involve different trade-offs between crop yield, water consumption and capital cost of equipment and structures. Irrigation methods such as most furrow and overhead sprinkler irrigation are usually less expensive but also less efficient, because much of the water evaporates or runs off. More efficient irrigation methods include drip or trickle irrigation, surge irrigation, and some types of sprinkler systems where the sprinklers are operated near ground level. These types of systems, while more expensive, can minimize runoff and evaporation. Any system that is improperly managed can be wasteful. Another trade-off that is often insufficiently considered is salinization of sub-surface water. Aquaculture is a small but growing agricultural use of water. Freshwater commercial fisheries may also be considered as agricultural uses of water, but have generally been assigned a lower priority than irrigation. As global populations grow, and as demand for food increases in a world with a fixed water supply, there are efforts underway to learn how to produce more food with less water, through improvements in irrigation methods and technologies, agricultural water management, crop types, and water monitoring.

Industrial

A power plant in Poland.

It is estimated that 15% of world-wide water use is industrial. Major industrial users include power plants, which use water for cooling or as a power source (i.e. hydroelectric plants), ore and oil refineries, which use water in chemical processes, and manufacturing plants, which use water as a solvent. The portion of industrial water usage that is consumptive varies widely, but as a whole is lower than agricultural use.

Household

Drinking water.

It is estimated that 15% of world-wide water use is for household purposes. These include drinking water, bathing, cooking, sanitation, and gardening. Basic household water requirements have been estimated by Peter Gleick at around 50 liters per person per day, excluding water for gardens.

Recreational

Whitewater rapids.

Recreational water use is usually a very small but growing percentage of total water use. Recreational water use is mostly tied to reservoirs. If a reservoir is kept fuller than it would otherwise be for recreation, then the water retained could be categorized as recreational usage. Release of water from a few reservoirs is also timed to enhance whitewater boating, which also could be considered a recreational usage. Other examples are anglers, water skiers, nature enthusiasts and swimmers. Recreational usage is usually non-consumptive. Golf courses are often targeted as using excessive amounts of water, especially in drier regions. It is, however, unclear whether recreational irrigation (which would include private gardens) has a noticeable effect on water resources. This is largely due to the unavailability of reliable data. Some governments, including the Californian Government, have labeled golf course usage as agricultural in order to deflect environmentalists' charges of wasting water. However, using the above figures as a basis, the actual statistical effect of this reassignment is close to zero.

Additionally, recreational usage may reduce the availability of water for other users at specific times and places. For example, water retained in a reservoir to allow boating in the late summer is not available to farmers during the spring planting season. Water released for whitewater rafting may not be available for hydroelectric generation during the time of peak electrical demand.

Environmental

Explicit environmental water use is also a very small but growing percentage of total water use. Environmental water usage includes artificial wetlands, artificial lakes intended to create wildlife habitat, fish ladders around dams, and water releases from reservoirs timed to help fish spawn. Like recreational usage, environmental usage is non-consumptive but may reduce the availability of water for other users at specific times and places. For example, water release from a reservoir to help fish spawn may not be available to farms upstream.

3. Match words with their definitions:

1. sewage	a) the protection of public health by removing and treating waste, dirty water etc;
2. reservoir	b) a building where electricity is produced to supply a large area [= power station]
3. sanitation	c) an activity that you do for pleasure or amusement
4. crop	d) a lake, especially an artificial one, where water is stored before it is supplied to people's houses;
5. power plant	e) the amount of wheat, rice, fruit etc that is produced in a season [= harvest]
6. fishery (plural fisheries)	f) the mixture of waste from the human body and used water that is carried away from houses by pipes under the ground
7. recreation	g) a part of the sea where fish are caught in large numbers

4. Complete the table.

Usage of water:	**Advantages**	**Disadvantages**
Agricultural		
Recreation.		

Environmental		
Industrial		
Household		

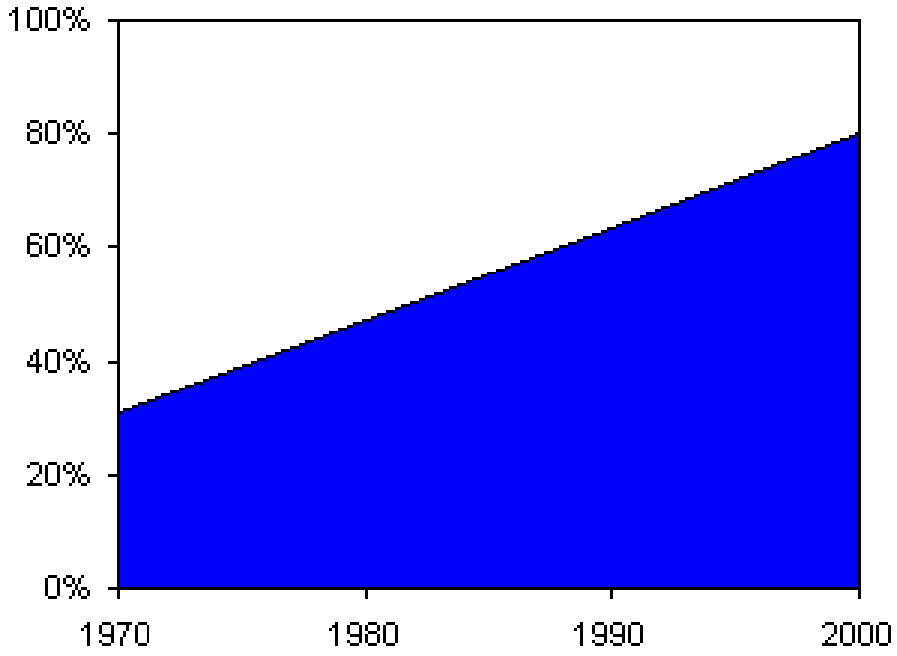
5. Complete these sentences with the following words:

**available for *to grow *rafting *amounts of *be considered *specific times*

1. A use of water is consumptive if that water is not immediately _____ another use.
2. In some areas of the world irrigation is necessary _____ any crop at all.
3. Water released for whitewater _____ may not be available for hydroelectric generation during the time of peak electrical demand.
4. Golf courses are often targeted as using excessive _____ water, especially in drier regions.
5. Freshwater commercial fisheries may also _____ as agricultural uses of water, but have generally been assigned a lower priority than irrigation.
6. Recreational usage may reduce the availability of water for other users at _____ and places.

6. Make up a summary of this text completing the following sentences:

1. The article (paper)
   - is headlined .....
   - about .....
   - carries information on .....
   - informs the reader of .....
2. Among the other problems the article raises the problem .....
3. The author gives some facts concerning .....
4. The author states that (thinks, emphasizes, explains, describes, presents) .....
5. Upon reading the paper, one realizes that .....
6. The paper surveys briefly (presents some interesting facts concerning) .....



Water stress

Best estimate of the share of people in developing countries with access to drinking water 1970–2000.

The concept of water stress is relatively simple: According to the World Business Council for Sustainable Development, it applies to situations where there is not enough water for all uses, whether agricultural, industrial or domestic. Defining thresholds for stress in terms of available water per capita is more complex, however, entailing assumptions about water use and its efficiency. Nevertheless, it has been proposed that when annual per capita renewable freshwater availability is less than 1,700 cubic meters, countries begin to experience periodic or regular water stress. Below 1,000 cubic meters, water scarcity begins to hamper economic development and human health and well-being.

UNIT 7
POLLUTION OF WATER

Health and Pollution

Water fit for human consumption is called drinking water or potable water. Water that is not potable may be made potable by filtration or distillation, or by a range of other methods.

Water that is not fit for drinking but is not harmful for humans when used for swimming or bathing is called by various names other than potable or drinking water, and is sometimes called safe water, or "safe for bathing". Chlorine is a skin and mucous membrane irritant that is used to make water safe for bathing or drinking. Its use is highly technical and is usually monitored by government regulations. Water for bathing may be maintained in satisfactory microbiological condition using chemical disinfectants such as chlorine or ozone or by the use of ultraviolet light.

In the USA, non-potable forms of wastewater generated by humans may be referred to as greywater, which is treatable and thus easily able to be made potable again, and blackwater, which generally contains sewage and other forms of waste which require further treatment in order to be made reusable. Greywater composes 50-80% of residential wastewater generated by a household's sanitation equipment (sinks, showers and kitchen runoff, but not toilets, which generate blackwater.) These terms may have different meanings in other countries and cultures.

This natural resource is becoming scarcer in certain places, and its availability is a major social and economic concern. Currently, about a billion people around the world routinely drink unhealthy water. Poor water quality and bad sanitation are deadly; some five million deaths a year are caused by polluted drinking water. The World Health Organization estimates that safe water could prevent 1.4 million child deaths from diarrhea each year. Water, however, is not a finite resource, but rather re-circulated as potable water in precipitation in quantities many degrees of magnitude higher than human consumption. Therefore, it is the relatively small quantity of water in reserve in the earth, that is a non-renewable resource, and it is, rather, the

distribution of potable and irrigation water which is scarce, rather than the actual amount of it that exists on the earth. Water-poor countries use importation of goods as the primary method of importing water, since the manufacturing process uses around 10 to 100 times products' masses in water.

In the developing world, 90% of all wastewater still goes untreated into local rivers and streams. Some 50 countries, with roughly a third of the world's population, also suffer from medium or high water stress, and 17 of these extract more water annually than is recharged through their natural water cycles. The strain not only affects surface freshwater bodies like rivers and lakes, but it also degrades groundwater resources.

1. Answer the questions:

1. What is the difference between safe and potable water?
2. What is chlorine used for?
3. What is "black" and "grey" water?
4. Do you think polluted drinking water sometimes cause deaths?
5. What is the situation with water treatment in developing countries?

2. Continue the sentences:

1. Greywater is treatable and thus easily able to _____.
2. Blackwater generally contains _____.
3. Water fit for human consumption is called _____.
4. Water-poor countries use importation of _____.
5. Chlorine is a skin and mucous membrane irritant that is used to _____.
6. Greywater composes 50-80% of residential wastewater generated by _____.
7. A household's sanitation equipment is sinks, _____.
8. Some 50 countries, with roughly a third of the world's population, also suffer from _____.
9. Water for bathing may be maintained in _____.
10. Chemical disinfectants are substances such as _____.

The Truth about Our Environment and Water

1. Find the following words using the vocabulary and match with their definition:

1. pollution	a) a substance that makes something dirty
2. man-made	b) water that comes out of a taprather than a bottle
3. research	c) the process of making air, water, soil etc dangerously dirty and not suitable for people to use, or the state of being dangerously dirty
4. cancer	d) drugs and medicines
5. tap water	e) a large mass of ice which moves slowly down a mountain valley
6. glacier	f) made by people, rather than by natural processes
7. metropolitan	g) a very serious disease in which cells in one part of the body start to grow in a way that is not normal
8. pharmaceuticals	h) relating or belonging to a very large city
9. municipal	i) serious study of a subject, in order to discover new facts or test new ideas
10. contaminant	j) the process of cleaning a liquid by passing it through a filter
11. filtration	k) relating to or belonging to the government of a town or city

What really happened to our tap water and underground water?

Clean water is one of the most important needs of our bodies. It is a sad fact that something as essential to life as clean drinking water can no longer be granted to us. Unsafe water is not just a third world problem. In fact, safe drinking water is even harder to find especially in industrially developed countries such as the U.S.

According to research articles and news, most tap and well water in the U.S. now are not safe for drinking due to heavy industrial and environmental pollution. We have reached to a point that, all sources of our drinking water, including municipal water systems, wells, lakes, rivers, and even glaciers, contain some level of

contamination. Contaminants range from naturally-occurring minerals to man-made chemicals and by-products. While many contaminants are found at levels not enough not to cause immediate discomforts or sicknesses , it is proven that even low-level exposure to many common contaminants will, over time, cause severe illness including liver damage, cancer, and other serious ailments. Even the chemicals commonly used to treat municipal water supplies such as chlorine and fluoride are toxic and are known to have significant adverse effects on the human body.

Tap water may also contain traces of prescription drugs. An investigation by the Associated Press has revealed the presence of a vast array of pharmaceuticals in municipal drinking water including antibiotics, anti-convulsants, mood stabilizers and sex hormones. These drugs were found in the drinking water supplies of at least 41 million Americans and in 24 major metropolitan areas – from Southern California to Northern New Jersey. The AP has mentioned reverse osmosis as a water filtration solution that removes virtually all pharmaceutical contaminants.

2. Fill the gaps using the following words:

** tap water * municipal * research * a glacier * pollution * man-made*

**pharmaceuticals * metropolitan * filtration * cancer*

1. Fresh _____ is usually heavily treated with chemicals and often chlorinated strongly enough actually to have a chemical smell.
2. Recent _____ has shown that human language is much older than we previously thought.
3. _____ from cars is the main cause of global warming.
4. Not far from the town centre is the _____ park.
5. It was as tall and cold as _____ rolling down a valley, crunching trees like matchsticks.
6. Current weather problems may actually be _____-_____, a direct result of environmental damage.
7. He died of _____ at the age of 63.
8. But when a _____ firm wants to launch a drug, James Dettore often tops the list of people to contact.

9. Some workers can only afford homes outside _____areas.
10. Aquarium _____ systems based on organic filters also have problems because toxins build up in the water.

3. Read the statements below and decide if they are True or False according to the text.

1. Clean water is one of the least important needs of our bodies._____
2. Safe drinking water is even harder to find especially in industrially developed countries._____
3. According to news, most tap water in the U.S. now is safe for drinking _____
4. Not all sources of our drinking water, including municipal water systems, wells, lakes, rivers, and even glaciers, contain some level of contamination _____
5. It is proven that even low-level exposure to many common contaminants will, cause several illness including liver damage and cancer._____
6. The chemicals commonly used to treat municipal water supplies such as chlorine and fluoride aren't safe _____
7. Some drugs were found in the drinking water supplies of at least 4 million Americans and in 20 major urban areas _____

4. Write down terms matching words from columns A and B. Chose three or four word combinations and make up sentences.

A	B
1. important	a) immediate discomforts
2. essential	b) needs
3. environmental	c) chemicals
4. municipal	d) water systems
5. man-made	e) pollution
6. to cause	f) articles
7. research	g) to life

Water in Ecosystem Sustainability

Water is one of the simplest chemical compounds. It plays a critical role in sustaining biological life on planet Earth. It is also a major natural resource for human use. To appreciate fully water policy options and how they are evaluated it is necessary to understand how economics is used and misused in the water area. This paper motivates the need for a more erudite and focused branch of economics dealing specifically with water. This branch is called hydroeconomics as a parallel to the terminology hydropolitics used by political scientists when discussing the political of water use.

At a fundamental level water has two uses: first, and foremost, sustaining the ecosysytem; and second as a natural resource for humankind. All other uses can be subsumed under these two.

In discussing water resources much of the literature refers to so-called “surplus” water supplies or “available” water. We should bear in mind that these are entirely anthropocentric concepts. In an ecosystem there are no “surplus” materials. Water is just re-allocated between species. This immediately raises the economic concept of “opportunity cost”. What is the opportunity cost for water re-allocated from one ecosystem to another?

For most humans, it is assumed that all the property in the ecosystem is theirs to dispose of as they see it. Indeed, many major religions sponsor the concept of humankind subjugating nature. Despite, this general assumption, and the problems it causes, humankind sometimes adopts laws and regulations protecting some species for their own purposes, not that of humans.

The discussion about scarcity is usually intimately bound up with the concepts of water as a renewable or non-renewable resource. If it is renewable, how can we ever run out of water? Certainly in many arid or semi-arid zones, people are currently experiencing shortages of water, partly due to population growth. It is noted that the cost of supplying additional water to water-short areas is increasing. As a result it becomes increasingly difficult to supply the same amounts of water to users at the old low prices.

Modern economics define water scarcity slightly differently; the need for water has to be expressed as a quantity and a price. This is called “the economic demand”.

1. Answer the questions:

1. What role does water play on our planet? Do you think it is the main natural resource on Earth?
2. How do you understand the words “hydroeconomics” and “hydropolitics “?
3. Do scientists consider water as renewable or non-renewable resource?

2. Fill in the gaps in the sentences:

1. It is necessary to understand how economics is _____ and _____ in the water area.
2. A more erudite and focused branch of economics dealing specifically with water is called _____.
3. Political scientists use the terminology of _____ when discussing the political of water use.
4. The first level where water is used is _____ the ecosysytem.
5. A natural resource for humankind is the _____ level where water is used.
6. In an ecosystem there are no “_____” materials.
7. The need for water has to be expressed as a _____ and a _____.
8. In many arid or semi-arid zones, people are currently experiencing _____ of water, partly due to population growth.
9. Humankind sometimes adopts _____ and _____ protecting some species for their own purposes.
10. It is noted that the cost of supplying additional water to _____ areas is increasing.

3. Make up a summary of the text.

Waste

Waste can exist as a solid, liquid, or gas. When released as a liquid or gas, waste is referred to as emissions. Identifying waste is a subjective matter, and waste is only

defined as such when perceived as such. Some see waste as a negative externality, but it can also be viewed as a potential resource as in industrial ecology.

Human waste is a term in the English language usually used to refer to byproducts of digestion, such as feces and urine. Human waste can be a serious health hazard, as it is a good vector for both viral and bacterial diseases. A major accomplishment of human civilization has been the reduction of disease transmission via human waste through the practice of hygiene and sanitation, including the development of theories of sewage systems and plumbing.

Waste produced in the wild is reintegrated through natural recycling processes, such as dry leaves in a forest decomposing into soil. Outside of the wild these wastes may become problematic, such as dry leaves in an urban environment. The highest volume of waste, outside of nature, comes from human industrial activity: mining waste, industrial waste, post-consumer waste, and so on. Most manufactured products are destined to become waste at some point in time, with a volume of waste production roughly similar to the volume of resource consumption.

Post-consumer waste is the waste produced by the end-user (the garbage one puts outside in the trash can). This is the waste people usually think of. But though the most visible, this is very small compare to the waste created in the process of mining and production.

When one considers that every product ends up as waste, it might be a good idea to analyse matter entering the production cycle, rather than analysing wastes that are usually diluted as a result of the process. For example, a consumer buying products containing heavy metals in small quantities will probably not detect these heavy metals in the resulting waste. An analysis of products entering the production system, and a guarantee from the provider, might be a wiser approach to prevent the final pollution (example : a farmer receiving sewage sludge to landfill on some of his field for fertilizing; the sewage sludge analysis is more likely to reveal the pollution than the soil itself after a couple of years).

1. Answer the questions:

1. What is waste?

2. Do you see waste as just negative externality?
3. What is a major accomplishment of human civilization?
4. Which human activities cause the highest volume of waste?
5. What do we call “a post-consumer waste”?

2. Match the words with their definitions:

sewage	return to a previous stage
fertilising	the surroundings or conditions in which a person, animal, or plant lives or operates
recycling	conditions relating to public health, especially the provision of clean drinking water and sewage disposal
analyse	making (soil or land) more fertile or productive by adding suitable substances
hygiene	the system of pipes, tanks, fittings required for the water supply, heating, and sanitation in a building
sanitation	maintaining health and prevention disease, especially through cleanliness
environment	a person who purchases goods and services for personal use
consumer	waste water and excrement
plumbing	relating to town or city
urban	examine methodically and in detail

3. Make up a summary of the text.

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